

Notice of Allowability

Application No.

09/764,680

Examiner

Chieh M. Fan

Applicant(s)

WRIGHT, ANDREW S.

Art Unit

2638

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the AF amendment filed 7/15/05.
2. ☒ The allowed claim(s) is/are 1-5,13-18,22,23 and 27-31.
3. ☒ The drawings filed on 12/2/04 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____. |

DETAILED ACTION

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Michael S. Okamoto on 8/22/05.

The application has been amended as follows:

In the claims:

- a. In claim **22**, line 13, "adjusting a relative amplitude of the second signal versus the first signal" has been changed to --- adjusting an amplitude of the second signal relative to the first signal ---.
- b. In claim **23**, line 13, "versus" has been changed to --- relative to ---.
- c. In claim **27**, line 6, "a modulated a carrier wave" has been changed to --- a modulated carrier wave ---.
- d. In claim **28**, line 6, "a modulated a carrier wave" has been changed to --- a modulated carrier wave ---.
- e. Claims **1** and **13** have been replaced by the following:

1. In a power amplifier system in which a digital input transmission signal is adaptively predistorted to compensate for non-linearities in an amplification process based on a difference between a desired and an observed amplifier output, a method of generating a digital error signal that accurately represents said difference, comprising:

- adaptively processing the digital input transmission signal at least partially in response to the digital error signal to generate a first modified signal that complements non-linearities resulting from the amplification process;

- converting the first modified signal to analog form to produce an analog modified signal which is related to a signal that is amplified by the amplification process;

- down-converting a radio frequency (RF) signal that represents an actual output of the amplifier system to generate a feedback signal;

- processing the digital input transmission signal to providing the desired output signal;

- converting the desired output signal to analog form to produce an analog delayed signal;

- taking a difference between the feedback signal and the analog delayed signal to generate an analog error signal;

- scaling the analog error signal to produce a scaled error signal that substantially corresponds to a range of an analog-to-digital converter;

- using the analog-to-digital converter to convert the scaled error signal to digital form to produce the digital error signal; and

- wherein processing the digital transmission signal to provide the desired output signal further comprising adaptively adjusting the processing to reduce a magnitude of the analog error signal.

13. A method of generating an error signal that can be used to reduce distortion in a radio frequency (RF) output signal of an RF transmitter, the method comprising:

- receiving an RF sample of the RF output signal of the transmitter;

down-converting the RF sample of the RF output signal to a down-converted signal;

receiving an input signal of the transmitter, where the input signal is digital;

delaying the input signal to produce a delayed input signal to approximately time align an analog delayed input signal with the down-converted signal;

converting, from digital to analog, the delayed input signal to the analog delayed input signals;

combining the down-converted signal with the analog delayed input signal to produce a modified down-converted signal such that an amplitude of the modified down-converted signal is reduced relative to an amplitude of the down-converted signal;

converting the modified down-converted signal, from analog to digital, to produce the error signal; and

wherein delaying the input signal further comprises adaptively adjusting the delay in response to the error signal to further reduce the amplitude of the modified down-converted signal.

Allowable Subject Matter

2. Claims 1-5, 13-18, 22, 23 and 27-31 are allowed and renumbered to 1-18. The following is an examiner's statement of reasons for allowance:

Regarding claims 1-5, the prior art of record does not teach or suggest "the processing the digital transmission signal to provide the desired output signal further comprising adaptively adjusting the processing to reduce a magnitude of the analog error signal."

Regarding claim 13, the prior art of record does not teach the limitation of "delaying the input signal further comprises adaptively adjusting the delay in response

Art Unit: 2638

to the error signal to further reduce the amplitude of the modified down-converted signal.”

Regarding claims 14 and 15, the prior art of record does not teach the limitation of “phase rotating the delayed input signal relative to the input signal to further reduce the amplitude of the modified down-converted signal.”

Regarding claims 16 and 17, the prior art of record does not teach the limitation of “scaling the delayed input signal relative to the down-converted signal such that the amplitude of the modified down-converted signal is further reduced.”

Regarding claim 18, the prior art of record does not teach the limitation of “adaptively scaling an amplitude of the modified down-converted signal in response to the error signal to conform the amplitude of the modified down-converted signal to an input range of an analog-to-digital converter” (emphasis added).

Regarding claim 22, the prior art of record does not teach the limitation of “adjusting an amplitude of the second signal relative to the first signal to decrease an amplitude of the error signal.”

Regarding claim 23, the prior art of record does not teach the limitation of “adjusting a phase of the second signal relative to the first signal to decrease an amplitude of the error signal.”

Regarding claim 27, the prior art of record does not teach that “the adaptive control processing and compensation estimator circuit further updates the digital filter at least partially in response to the digital summed output, where the updates vary the delay of the digital filter to increase the destructive interference at the summing node.”

Regarding claims 28 and 29, the prior art of record does not teach that "the digital filter further phase rotates and amplitude scales the delayed input signal to increase the destructive interference at the summing node."

Regarding claims 30 and 31, the prior art of record does not teach "a digital filter adapted to delay and phase rotate an input signal of the RF transmitter along a side path" (emphasis added).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M. Fan whose telephone number is (571) 272-3042. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Chieh M Fan
Primary Examiner
Art Unit 2638

cmf
August 19, 2005